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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,525	06/10/2005	Geoffrey Harding	PHNL031185US	3670
24737 7590 08/06/2007 PHILIPS INTELLECTUAL PROPERTY & STANDARDS P.O. BOX 3001 BRIARCLIFF MANOR, NY 10510			EXAMINER ARTMAN, THOMAS R	
			ART UNIT 2882	PAPER NUMBER
			MAIL DATE 08/06/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/538,525

Applicant(s)

HARDING, GEOFFREY

Examiner

Thomas R. Artman

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-15,17,18 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-15,17,18 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 20<sup>th</sup>, 2007, has been entered.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-15, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitaker (US 4,622,687) in view of Arndt (US 6,282,263 B1).

Regarding claims 1, 14 and 15, Whitaker discloses an X-ray source (Figs.1, 3 and 15), including:

- a) an electron source 153 for the emission of electrons,
- b) a target 20 for the emission of characteristic, substantially monochromatic X-rays in response to the incidence of the electrons, the target being made of a metal foil 149, 151 having a high atomic number allowing the generation of X-rays 145, and

c) an outcoupling means (not shown) for outcoupling the X-rays on the side of the metal foil on which the electrons are incident and which is opposite to the side of the base arrangement (Fig.15).

Whitaker does not specifically disclose that the metal foil has a thickness of 10  $\mu\text{m}$  or less, and further that the target has a base arrangement being made of a material having a low atomic number such that X-rays are not generated from the base arrangement.

Arndt specifically teaches the practice of forming a target 4 as a metal foil upon a base arrangement made of carbon (col.6, lines 5-18), where the metal foil is less than 10  $\mu\text{m}$  thick. In this way, the target is more efficiently cooled in order to operate the X-ray source for longer periods of time and/or at higher energies, as needed (col.6, lines 14-18).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Whitaker to add a base arrangement of carbon and make the metal foil 10  $\mu\text{m}$  or less, as taught by Arndt, in order to greatly increase the cooling efficiency of the target.

Further regarding claims 1 and 14, the Whitaker/Arndt combination results in a base arrangement that is rotatable and includes carbon, a material with an atomic number less than 10.

With respect to claims 3-5 and 17, both Whitaker and Arndt disclose a cooling circuit as part of the base arrangement (Figs.3 and 15 of Whitaker; Fig.2; col.4, lines 31-34 and 37-38 of Arndt), where coolant flows along the side of the metal foil opposite to the side on which the electrons are incident.

However, Whitaker does not specifically disclose the type of coolant.

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Arndt specifically teaches the use of water as a coolant, a coolant having a mean atomic number less than 10. Water is cheap and plentiful, as is known in the art, and water also has a high heat capacity, making it an economical and efficient choice of coolants.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Whitaker to use water as a coolant, as taught by Arndt, in order to provide a cost-effective and efficient cooling system for the anode.

With respect to claims 6 and 18, Whitaker further discloses a constriction in the cooling circuit in the area 43 of the metal foil (Fig.3).

With respect to claim 7, the Whitaker/Arndt combination results in a base arrangement that includes carbon, a material with an atomic number less than 10.

With respect to claim 8, Arndt teaches that the metal foil has a thickness less than 5  $\mu\text{m}$ .

With respect to claim 9, Whitaker does not specifically disclose the material of the target.

Arndt teaches that the metal of the foil target has an atomic number between 40 and 80 depending upon the desired wavelength(s) (col.4, lines 25-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Whitaker to use a target material for the metal foil having an atomic number between 40 and 80, as taught by Arndt, in order to achieve a desired output wavelength, as taught by Arndt.

With respect to claim 10, Whitaker further discloses that the outcoupling means is adapted to outcouple X-rays at an angular range from substantially 45 to 135 degrees (Fig.15).

With respect to claim 11, Whitaker further discloses that the outcoupling means is adapted to outcouple X-rays in a direction substantially antiparallel to the direction of incidence of the electrons (Fig.15).

With respect to claim 12, Whitaker further discloses that the electrons are directed onto the surface of the metal foil at a substantially 90 degree angle (Fig.3).

With respect to claim 13, Whitaker further discloses that the electron source is located outside the X-ray beam (Fig.15) to be outcoupled, and the X-ray source has means for directing the electron beam onto the metal foil (cathode).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Whitaker and Arndt, as applied to claim 1 above, in view of Wilson (US 6,947,522 B2).

Whitaker and Arndt do not specifically disclose that the outcoupled x-rays are approximately 150 to 210 degrees from the incident electrons. However, Arndt does teach that the target may be inclined to the incident electron beam in order to reduce the absorption of emitted x-rays (col.4, lines 28-30).

Wilson specifically teaches an x-ray source arrangement (Fig.4) where the incident electron beam 82 is nearly parallel with the surface 80 of the anode layer 52. In this

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arrangement, the emitted x-rays 90 (outcoupled through window 34, Fig.1) are within the range of 150 to 180 degrees from the incident electron beam (col.4, line 60 through col.5, line 11). The arrangement provides the ability to control overheating of the anodes (col.2, lines 33-36). It is also readily recognized by the skilled artisan that the inclination will also provide the advantage taught by Arndt, where the absorption of the emitted x-rays, by the target, is greatly reduced in that angular range.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Whitaker to incline the metal foil such that the outcoupling means outcouples x-rays at an angle between 150 and 210 degrees from the incident electron beam, as taught by Wilson, in order to effectively mitigate x-ray absorption by the target, as taught by Arndt, and to effectively mitigate overheating of the target, as taught by Wilson.

### ***Response to Arguments***

Applicant's arguments filed June 20<sup>th</sup>, 2007, have been fully considered but they are not persuasive.

The prior art combination of Whitaker in view of Arndt renders claims 1, 14 and 15 obvious for reasons as stated in the Final Rejection, dated 5/9/07. Whitaker has a fluid-cooled metal x-ray target on a rotating base plate, and Arndt specifically teaches thin x-ray targets (10 microns or less) mounted upon diamond substrates (carbon, atomic number less than 10) for the purpose of improving the cooling efficiency of the target when cooled with fluid (see col.4, lines 25-50 and col.6, lines 5-18 of Arndt).

Furthermore, the present amendments to claims 1, 14 and 15 do not distinguish the claimed invention over the prior art. Both Whitaker and Arndt specifically teach reflection x-ray targets and x-ray windows that extract x-rays from the reflection side of the target surface (opposite the coolant side, see at least Figs.1 and 2 of Arndt and Figs.3 and 15 of Whitaker).


### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas R. Artman  
Patent Examiner



EDWARD J. GLICK  
SUPERVISORY PATENT EXAMINER